LISTING OF CLAIMS:

1. (Currently Amended) A method for obtaining a three-dimensional representation of a light source distribution located inside a mammal, the method comprising:

obtaining a topographical surface representation of the mammal; ~~and~~

providing surface light image data from light emitted from a surface of the mammal originating from the light source distribution located inside the mammal; and

using a processing system, reconstructing a three-dimensional representation of the light source distribution internal to the mammal using the topographical surface representation and the surface light emission data.

2. (Canceled)

3. (Previously Presented) The method of claim 1 further comprising dividing the topographical surface representation into a set of surface elements.

4. (Original) The method of claim 3 wherein each surface element is approximated as planar.

5. (Previously Presented) The method of claim 3 further comprising creating a set of volume elements within the mammal.

6. (Original) The method of claim 5 wherein each volume element is modeled to contain a point light source at its center.

7. (Original) The method of claim 6 wherein the three-dimensional representation of the light source distribution is approximated by a set of point light sources.

8. (Previously Presented) The method of claim 5 further comprising converting the surface light image data into photon density just inside the surface of the mammal.

9. (Original) The method of claim 8 wherein there is a linear relation between the light source emission strength in a given volume element and the photon density just inside a surface element.

10. (Original) The method of claim 5 further comprising defining a cost function and a set of constraints for obtaining a solution for the three-dimensional representation of the light source distribution.

11. (Previously Presented) The method of claim 10 wherein the cost function is related to a sum of source strengths for each point source in the mammal, and the constraints include the following conditions: (i) that the source strengths be positive definite and (ii) that the resulting photon density at the object surface produced by the distribution of point sources be everywhere less than the measured surface photon density.

12. (Original) The method of claim 11 wherein obtaining the three-dimensional representation maximizes the cost function subject to the constraints.

13. (Original) The method of claim 10 wherein the cost function and constraints are described mathematically by a system of linear equations, and a solution for the three-dimensional representation of the source distribution is obtained using a SIMPLEX method.

14. (Original) The method of claim 10 further comprising including a weighting factor in the cost function that can be varied to produce a set of solutions for the three-dimensional representation of the source distribution.

15. (Original) The method of claim 10 further comprising varying the number of surface elements to produce a set of solutions for the three-dimensional representation of the source distribution.

16. (Original) The method of claim 5 further comprising varying one of a) the number of volume elements, and b) the configuration of volume elements, to produce a set of solutions for the three-dimensional representation of the source distribution.

17. (Original) The method of claim 5 further comprising optimizing the three-dimensional representation of the light source distribution by calculating the surface light emission for each solution and selecting a solution which minimizes a difference between a calculated and measured surface emission.

18. (Original) The method of claim 16 wherein the varying the number of volume elements and varying the configuration of volume elements both comprise adaptive meshing.

19. (Original) The method of claim 18 wherein the adaptive meshing increases the number of volume elements used to describe the three-dimensional representation of the light source.

20. (Original) The method of claim 19 wherein the adaptive meshing removes volume elements having zero light source strength.

21. (Previously Presented) The method of claim 5 wherein the transport of light within the mammal from a given volume element to a given surface element is described by a Green's function.

22. (Original) The method of claim 21 wherein the Green's function is defined as a solution for light diffusion in a homogenous half space having a planar boundary perpendicular to the line connecting the volume element and the surface element.

23. (Previously Presented) The method of claim 21 wherein the mammal interior is approximated to be inhomogeneous.

24. (Original) The method of claim 21 wherein the Green's function is defined in a look-up table.

25. (Original) The method of claim 21 wherein the Green's function is calculated using Monte Carlo simulations or Finite Element Modeling.

26. (Original) The method of claim 1 wherein the light source is comprised of bioluminescent or fluorescent emission.

27. (Original) The method of claim 1 further comprising applying a noise threshold to the surface light image data.

28. (Original) The method of claim 27 wherein the noise threshold is related to one of the peak intensity in the surface light image data and the dynamic range in the surface light image data.

29. (Original) The method of claim 28 wherein the noise threshold is related to the peak intensity in the surface light image data divided by dynamic range in the surface light image data.

30. (Original) The method of claim 27 wherein the surface representation is divided into a set of surface elements and all surface elements having surface emission below the noise threshold are removed.

31. (Previously Presented) The method of claim 1 wherein the light source emits light that passes through mammal tissue.

32. (Original) The method of claim 31 wherein the animal tissue is approximated to be homogenous.

33. (Previously Presented) The method of claim 1 wherein the mammal has a complex boundary.

34. (Original) The method of claim 1 further comprising producing multiple possible three-dimensional representations of the light source and the three-dimensional representation of the light source obtained is the representation that best fits the measured surface light image data.

35. (Previously Presented) The method of claim 1 further comprising placing the mammal on a stage included in an imaging chamber coupled to a camera configured to capture an image of the mammal on the stage.

36. (Previously Presented) The method of claim 34 further comprising:

    moving the stage to a first position in the imaging chamber; and

    capturing a first image set of the mammal from the first position using the camera.

37. (Original) The method of claim 35 wherein the first image set is comprised of a luminescent image, a structured light image, and a photographic image.

38. (Previously Presented) The method of claim 34 further comprising:

    moving the stage to one or more other positions in the imaging chamber, wherein the other positions have different angles relative to a fixed datum associated with the camera than the first position; and

    capturing additional image sets of the mammal from the other positions using the camera.

39. (Previously Presented) The method of claim 38 wherein obtaining the surface representation comprises building a topographic representation of the mammal based on structured light data included in one or more structured light images.

40. (Currently Amended) The method of claim 34 wherein the surface light image data is obtained at ~~one or more~~ **a plurality of** different wavelengths.

41-52. (Canceled)